

with which the present work does not compete in fulness of treatment, the different parts of the subject being elaborated only so far as will be assimilable by students. In dealing with matters that are still unsettled, the author shows considerable judgment, but he has perhaps a tendency to over-refine the division and classification of phenomena, as, for example, in discussing symbiosis, parasitism, and fermentation.

Short passages, in square brackets, have been interpolated by the author here and there in this issue with the intention of bringing the text up-to-date. Special details may be thus indicated, but broader advances can hardly be dealt with in this way; nevertheless, the work is the most modern exposition of the physiology of plants available in any language.

F. F. B.

LIQUID AND GASEOUS FUELS.

Liquid and Gaseous Fuels, and the Part They Play in Modern Power Production. By Prof. V. B. Lewes. Pp. xiv+334. (London: A. Constable and Co., Ltd., 1907.) Price 6s. net.

WITH the multiplication of institutions where the teaching of applied science is made a leading feature, there has sprung into existence quite a number of text-books which specially appeal to students of this kind. Some of these works are both interesting and useful, but it must be confessed that they one and all seem rather to appeal to the type of mind which is disinclined to attack any really difficult problems. Text-books such as were published twenty years ago, by men such as Rankin and Cotterill, which endeavoured to get at the scientific principles underlying the applications of applied science, seem, with very few exceptions, to have gone out of date and to have become replaced with more interesting and better written books, dealing more or less with the descriptive part of the subject which they treat. Prof. Lewes very modestly states that he does not wish to produce a work that shall, to any extent, enter into detail, and his book is professedly a sketch of the subject. This is to be regretted, as we feel sure that a chemist of such eminence could have produced a work which would have been of great value, not only to the students, but to that large class of engineers who wish to get information on some of the difficult points in connection with both liquid and gaseous fuels.

The chapters on combustion deal wholly with burning at ordinary pressures, and are both clear and accurate. It is unfortunate that the scope of the work does not allow Prof. Lewes to allude to some of the phenomena of burning under pressure, a subject of enormous importance, and one of which very little is known.

The description of the various forms of solid fuels, together with the determination of their calorimetric values, is well done, but we should have expected to find something said about the discrepancy which almost always occurs when using the Junker calorimeter with gas and air, which has not been completely saturated, as this affects the quantity of condensed

water that has to be measured in order to obtain the lower value.

There is a great deal of useful information on the subject of liquid fuels; the arrangement of the hydrocarbons contained in these fuels is very well brought out, and no student can read through this chapter without acquiring a good idea of the various forms of liquid fuels derived from a common base.

The manufacture of coal-gas is, of course, of very considerable interest. There is nothing very novel, nor, should we say, of much service to the average student, unless, indeed, he is proposing to become a gas engineer.

There is an excellent description of the various methods of making water-gas, which at one time it was anticipated would play a very considerable part in the application of cheap gas for both heating and power purposes, and is very largely used for certain work. The large percentage of carbon monoxide which it contains has caused it to be looked upon with suspicion, except for the purpose of carburetted water-gas for use in coal-gas mains, and it is probable that very little water-gas is used for any other purpose, although, probably, this gas would be very much more used if it were possible to obtain a reduction in the standard now insisted upon as regards the illuminating value of gas.

The description of the producers proper is not so full as the merits of these producers would entitle them to. The suction producer is alluded to, but not described to any great length, and in considering the bituminous producers Prof. Lewes appears to consider that it is essential in bituminous plants to recover the ammonia. This is, of course, a mistake. There are a large number of bituminous plants running which do not recover the ammonia, and which are perfectly satisfactory. Indeed, it is doubtful whether in the method of using excess steam in order to prevent the destruction of ammonia the value of the bituminous plant is not brought down, as a much better gas can be made when the steam is cut down to the lowest amount which can be used to prevent clinkering.

The last chapter, which deals with the fuel of the future, is certainly the most interesting of the whole work, and it points out very clearly that when the existing supplies of fuel become limited, we shall have to fall back upon alcohol, produced from vegetation of some sort or another, which may be made almost inexhaustible. There is no doubt that this is quite correct, and it is very much to be regretted that at present no experiments on alcohol on any scale can be made, owing to the restrictions which our fiscal conditions impose, and we presume that owing to this, the work will be carried out in some other country where the Government is more sympathetic towards scientific research.

There is one point which Prof. Lewes appears to have overlooked. He considers that the alcohol will be either manufactured from potato starch or sawdust. There seems no reason to doubt that when the question becomes urgent some highly-specialised plant will have been brought into existence for the sole

purpose of absorbing the maximum amount of carbon dioxide from the air, and in this manner it may be possible enormously to increase the amount of carbon which a given area of land will pick up. This may sound fanciful, but the wonderful improvements which hybridisation has effected in the past make it quite possible that in the future still greater improvements may be looked for.

A PRACTICAL HANDBOOK ON RUBBER.

Rubber Cultivation in the British Empire. By Herbert Wright. Pp. vi+100. (London: Macmillan and Sons, 1907.) Price 2s. 6d.

THIS is one of the most interesting and useful little books yet published on rubber cultivation, and should be in the hands of every planter. It is a reprint of a lecture delivered before the Society of Arts. The book is not only of great value to those interested in plantation rubber, but also to those interested in the development of wild rubber. Mr. Herbert Wright, who was at one time controller of the Government experimental station in Ceylon, is now the editor of the *India Rubber Journal*. He is also the author of one of our best standard works on rubber, viz. "Hevea Brasiliensis," which is a scientific treatise on the botany of rubber. The present publication is more in the form of a useful and practical handbook, and deals with the great potentialities of the rubber industry, and its importance from "the producer's standpoint, especially in British possessions."

The gradually increasing demand for raw rubber, and the remunerative prices obtained, have produced enormous developments in the past few years on Eastern plantations. At the present the most important centre for rubber collection is tropical America, which supplies about 60 per cent. of the world's output. Africa comes next with 30 per cent. to 35 per cent., but tropical Asia last year only contributed 3 per cent. Borneo, New Guinea, Fiji, New Caledonia, and the Seychelles are also commencing to develop a strong interest in rubber-producing plants.

"It may be safely stated," writes Mr. Wright, "that to-day there are no less than 14,000,000. of English money represented as paid up capital in companies directly or indirectly concerned with rubber growing. Furthermore, it may be estimated that approximately 30,000,000. worth of rubber may be consumed during the present year."

The natural order which supplies the greater part of the world's rubber is the Euphorbiaceæ, the most valuable species being the Hevea, which produces the well-known Para rubber which has been planted so extensively in Ceylon, Federated Malay States, Straits Settlements, and Sumatra.

Mr. Wright speaks with considerable authority and experience on plantation Para rubber, and he thinks that it will sooner or later obtain a prominent, if not the commanding, position as a source of future rubber; but this will not be for many years, for in speaking of wild rubber he says:—

"Should the supply from wild sources become scarce—an improbable occurrence—it would be impossible for the plantations to supply the balance for many

years to come, as the producing capacity of the land now alienated for rubber in the East will only be in 1912 or 1913 some 12,500 to 25,000 tons per year. The rubber manufacturers have hitherto been dependent, almost entirely, on wild rubber; and it seems illogical to suggest that the rubber forests on which so much new capital and enterprise have been recently expended, and in which prominent scientific and business men are concerned, will be unable to satisfy the increased demand expected in the next few years. It may confidently be regarded as the principal source of rubber for the next half score of years, for the simple reason that plantations in the proper sense do not exist to produce what will be required."

At the end of the lecture there is an instructive discussion, in which Lieut.-Col. Prain, Mr. Gray, Mr. Fritz Zorn, and Mr. S. Figgis took part.

L. C. B.

OUR BOOK SHELF.

School Hygiene; a Handbook for Teachers of all Grades, School Managers, &c. By Herbert Jones. Pp. x+151. Dent's Mathematical and Scientific Text-books for Schools. (London: Dent and Co., 1907.) Price 2s.

THIS is one of the many books that the great movement towards school hygiene has thrown up. The book, or rather booklet, contains practically nothing that is new, but the selection of topics is done with judgment and care; every main subject of environmental hygiene is touched on with sufficient fulness to meet the needs of immediate practice or to provoke to further reading, and the illustrations are profuse and good. The author has succeeded in treating "the subject as simply as possible." The work of Dr. Kerr at the London County Council is largely drawn upon. As in Dr. Newsholme's "School Hygiene," the book is allocated half to the school and half to the scholar. In criticism, it may be said that rather much space is given to matters, e.g. site, building construction, and sanitary appliances, &c., that the teacher cannot alter or affect, and rather little space to what he can affect. But with this qualification the booklet forms a good introduction to the subject. The writing is well adapted to the intended readers.

Regeneration and Transplantation. By Prof. E. Korschelt. Pp. 286; 144 figures. (Jena: G. Fischer, 1907.) Price 7 marks.

Of recent years there has been much experimenting and not a little theorising regarding regeneration and grafting. The results of the experiments have sometimes been very remarkable and full of theoretical suggestiveness, and they are now so numerous that a general survey of their import is very welcome. We have already a volume on regeneration by Prof. T. H. Morgan which has been of great service; we have now an analogous volume by Prof. Korschelt. He traces the phenomena of regeneration through the world of organisms, in unicellulars and multicellulars, in plants and in animals, in young forms and full-grown forms, showing the varied distribution of the regenerative capacity and its varied expressions, and always returning to the central question, How has it come about, and by what precise processes does it come about, that a lost part is re-grown and the intactness of the creature restored? Special sections of the book are devoted to a discussion of such subjects as the following:—autotomy, often-repeated regeneration, restitutions and regulations, heteromorphosis, atavism in regeneration, imperfect and superfluous regeneration, the relation of the nervous system to